

# NASA TECH BRIEF

## *Ames Research Center*



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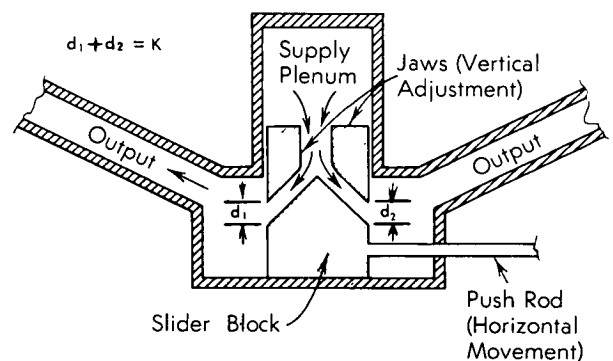
### Dynamic Valve to Supply Constant Total Thrust to Two Orifice Jets

A design has been proposed for a valve that will divide gas flow between two orifice jets in proportions varied by an external control while maintaining a constant total flow. The valve can supply two variable thrusts with a constant sum, and it can be driven mechanically in periodic alternations to yield correspondingly periodic outputs of constant sum.

The characteristics of the valve are determined by its geometry, as illustrated in the diagram. The V-shaped slider block fits into the matching jaws which are located at the outlet of a plenum. The jaws are vertically adjustable, and are positioned so as to develop two passages leading to the outlets. Horizontal movement of the V-block will enlarge one passage at the expense of the other but the sum of the cross-sectional areas will remain constant for any fixed position of the vertically adjustable jaws.

If the supply pressure is sufficiently high, flow through both passages is choked and hence independent of downstream conditions. Thus, the mass flowing through the two areas will also have a constant sum. If the outputs are connected to nozzles in which flow is also choked, the sum of the thrusts will be constant, and if the push rod is driven back and forth at a sinusoidal rate, the output thrusts will also vary sinusoidally with an amplitude dependent on the amplitude of drive and a mean value dependent on the mean position of the slider block. The sum of the thrusts will have a constant magnitude dependent on the aperture provided by the vertically adjustable jaws and the plenum pressure. There are two special advantages from having the valve and the nozzles

choked: (1) the device provides constant sum of thrusts; (2) small variations in flow resistance do not affect thrusts.



#### Notes:

1. This innovation was conceived for application in the development of a jet flap for helicopter use. The design is based on simplified assumptions, but it has the virtue of combining relative accuracy with mechanical simplicity.
2. The device may be useful in a multinozzle system, where the constancy of total thrust is important.
3. No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer  
Ames Research Center  
Moffett Field, California 94035  
Reference: B72-10120

(continued overleaf)

**Patent status:**

No patent action is contemplated by NASA.

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